



SEQUENCE LISTING

<110> DIVERSA CORPORATION
SHORT, Jay M.
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MATHUR, Eric J.

<120> ENZYMES HAVING TRANSAMINASE AND AMINOTRANSFERASE ACTIVITY AND
METHODS OF USE THEREOF

<130> DIVER1240-7

<140> US 09/905,173

<141> 2001-07-12

<150> US 09/412,184

<151> 1999-10-04

<150> US 09/389,537

<151> 1999-09-02

<150> US 08/646,590

<151> 1996-05-08

<150> US 08/599,171

<151> 1996-02-09

<150> US 09/481,733

<151> 2000-01-11

<150> US 09/069,226

<151> 1998-04-27

<160> 40

<170> PatentIn version 3.0

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 <213> Ammonifex degensii

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a!
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a'
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<212> DNA

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<400> 25

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35 40 45

Pro Pro Ala Lys His Ile Ile Asp Lys Leu Cys Glu Val Ala Gln Lys
50 55 60

Pro Asn Val His Gly Tyr Ser Ala Ser Arg Gly Ile Pro Arg Leu Arg
65 70 75 80

Lys Ala Ile Cys Asn Phe Tyr Glu Glu Arg Tyr Gly Val Lys Leu Asp
85 90 95

Pro Glu Arg Glu Ala Ile Leu Thr Ile Gly Ala Lys Glu Gly Tyr Ser
100 105 110

His Leu Met Leu Ala Met Ile Ser Pro Gly Asp Thr Val Ile Val Pro
115 120 125

Asn Pro Thr Tyr Pro Ile His Tyr Tyr Ala Pro Ile Ile Ala Gly Gly
130 135 140

Glu Val His Ser Ile Pro Leu Asn Phe Ser Asp Asp Gln Asp His Gln
145 150 155 160

Glu Glu Phe Leu Arg Arg Leu Tyr Glu Ile Val Lys Thr Ala Met Pro
165 170 175

Lys Pro Lys Ala Val Val Ile Ser Phe Pro His Asn Pro Thr Thr Ile
180 185 190

Thr Val Glu Lys Asp Phe Phe Lys Glu Ile Val Lys Phe Ala Lys Glu
195 200 205

His Gly Leu Trp Ile Ile His Asp Phe Ala Tyr Ala Asp Ile Ala Phe
210 215 220

Asp Gly Tyr Lys Pro Pro Ser Ile Leu Glu Ile Glu Gly Ala Lys Asp
225 230 235 240

Val Ala Val Glu Leu Tyr Ser Met Ser Lys Gly Phe Ser Met Ala Gly
245 250 255

Trp Arg Val Ala Phe Val Val Gly Asn Glu Ile Leu Ile Lys Asn Leu

a!
Cont

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Thr Ala Lys Val Tyr Gln Lys Arg Arg Asp Val Leu Val Glu Gly Leu 305	310	315
Asn Arg Leu Gly Trp Lys Val Lys Lys Pro Lys Ala Thr Met Phe Val 325	330	335
Trp Ala Lys Ile Pro Glu Trp Ile Asn Met Asn Ser Leu Asp Phe Ser 340	345	350
Leu Phe Leu Leu Lys Glu Ala Lys Val Ala Val Ser Pro Gly Val Gly 355	360	365
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<210> 26
 <211> 373
 <212> PRT
 <213> Aquifex

<400> 26

Met Asp Arg Leu Glu Lys Val Ser Pro Phe Ile Val Met Asp Ile Leu
1 5 10 15

Ala Gln Ala Gln Lys Tyr Glu Asp Val Val His Met Glu Ile Gly Glu
20 25 30

Pro Asp Leu Glu Pro Ser Pro Lys Val Met Glu Ala Leu Glu Arg Ala
35 40 45

Val Lys Glu Lys Thr Phe Phe Tyr Thr Pro Ala Leu Gly Leu Trp Glu
50 55 60

Leu Arg Glu Arg Ile Ser Glu Phe Tyr Arg Lys Lys Tyr Ser Val Glu
65 70 75 80

Val Ser Pro Glu Arg Val Ile Val Thr Thr Gly Thr Ser Gly Ala Phe
85 90 95

Leu Val Ala Tyr Ala Val Thr Leu Asn Ala Gly Glu Lys Ile Ile Leu
100 105 110

Pro Asp Pro Ser Tyr Pro Cys Tyr Lys Asn Phe Ala Tyr Leu Leu Asp
115 120 125

Ala Gln Pro Val Phe Val Asn Val Asp Lys Glu Thr Asn Tyr Glu Val

al
Cont

130

135

140

Arg Lys Glu Met Ile Glu Asp Ile Asp Ala Lys Ala Leu His Ile Ser
145 150 155 160

Ser Pro Gln Asn Pro Thr Gly Thr Leu Tyr Ser Pro Glu Thr Leu Lys
165 170 175

Glu Leu Ala Glu Tyr Cys Glu Glu Lys Gly Met Tyr Phe Ile Ser Asp
180 185 190

Glu Ile Tyr His Gly Leu Val Tyr Glu Gly Arg Glu His Thr Ala Leu
195 200 205

Glu Phe Ser Asp Arg Ala Ile Val Ile Asn Gly Phe Ser Lys Tyr Phe
210 215 220

Cys Met Pro Gly Phe Arg Ile Gly Trp Met Ile Val Pro Glu Glu Leu
225 230 235 240

Val Arg Lys Ala Glu Ile Val Ile Gln Asn Val Phe Ile Ser Ala Pro
245 250 255

Thr Leu Ser Gln Tyr Ala Ala Leu Glu Ala Phe Asp Tyr Glu Tyr Leu
260 265 270

Glu Lys Val Arg Lys Thr Phe Glu Glu Arg Arg Asn Phe Leu Tyr Gly
275 280 285

Glu Leu Lys Lys Leu Phe Lys Ile Asp Ala Lys Pro Gln Gly Ala Phe
290 295 300

Tyr Val Trp Ala Asn Ile Ser Asp Tyr Ser Thr Asp Ser Tyr Glu Phe
305 310 315 320

Ala Leu Lys Leu Leu Arg Glu Ala Arg Val Ala Val Thr Pro Gly Val
325 330 335

Asp Phe Gly Lys Asn Lys Thr Lys Glu Tyr Ile Arg Phe Ala Tyr Thr
340 345 350

Arg Lys Ile Glu Glu Leu Lys Glu Gly Val Glu Arg Ile Lys Lys Phe
355 360 365

Leu Glu Lys Leu Ser
370

<210> 27
<211> 453
<212> PRT
<213> Aquifex

<400> 27

Met Trp Glu Leu Asp Pro Lys Thr Leu Glu Lys Trp Asp Lys Glu Tyr
1 5 10 15

Phe Trp His Pro Phe Thr Gln Met Lys Val Tyr Arg Glu Glu Glu Asn
20 25 30

Leu Ile Phe Glu Arg Gly Glu Gly Val Tyr Leu Trp Asp Ile Tyr Gly

a!
Cont

35	40	45
Arg Lys Tyr Ile Asp Ala Ile Ser Ser Leu Trp Cys Asn Val His Gly 50 55 60		
His Asn His Pro Lys Leu Asn Asn Ala Val Met Lys Gln Leu Cys Lys 65 70 75 80		
Val Ala His Thr Thr Thr Leu Gly Ser Ser Asn Val Pro Ala Ile Leu 85 90 95		
Leu Ala Lys Lys Leu Val Glu Ile Ser Pro Glu Gly Leu Asn Lys Val 100 105 110		
Phe Tyr Ser Glu Asp Gly Ala Glu Ala Val Glu Ile Ala Ile Lys Met 115 120 125		
Ala Tyr His Tyr Trp Lys Asn Lys Gly Val Lys Gly Lys Asn Val Phe 130 135 140		
Ile Thr Leu Ser Glu Ala Tyr His Gly Asp Thr Val Gly Ala Val Ser 145 150 155 160		
Val Gly Gly Ile Glu Leu Phe His Gly Thr Tyr Lys Asp Leu Leu Phe 165 170 175		
Lys Thr Ile Lys Leu Pro Ser Pro Tyr Leu Tyr Cys Lys Glu Lys Tyr 180 185 190		
Gly Glu Leu Cys Pro Glu Cys Thr Ala Asp Leu Leu Lys Gln Leu Glu 195 200 205		
Asp Ile Leu Lys Ser Arg Glu Asp Ile Val Ala Val Ile Met Glu Ala 210 215 220		
Gly Ile Gln Ala Ala Ala Gly Met Leu Pro Phe Pro Pro Gly Phe Leu 225 230 235 240		
Lys Gly Val Arg Glu Leu Thr Lys Lys Tyr Asp Thr Leu Met Ile Val 245 250 255		
Asp Glu Val Ala Thr Gly Phe Gly Arg Thr Gly Thr Met Phe Tyr Cys 260 265 270		
Glu Gln Glu Gly Val Ser Pro Asp Phe Met Cys Leu Gly Lys Gly Ile 275 280 285		
Thr Gly Gly Tyr Leu Pro Leu Ala Ala Thr Leu Thr Thr Asp Glu Val 290 295 300		
Phe Asn Ala Phe Leu Gly Glu Phe Gly Glu Ala Lys His Phe Tyr His 305 310 315 320		
Gly His Thr Tyr Thr Gly Asn Asn Leu Ala Cys Ser Val Ala Leu Ala 325 330 335		
Asn Leu Glu Val Phe Glu Glu Glu Arg Thr Leu Glu Lys Leu Gln Pro 340 345 350		
Lys Ile Lys Leu Leu Lys Glu Arg Leu Gln Glu Phe Trp Glu Leu Lys 355 360 365		

Q1
Cont

His Val Gly Asp Val Arg Gln Leu Gly Phe Met Ala Gly Ile Glu Leu
370 375 380

Val Lys Asp Lys Glu Lys Gly Glu Pro Phe Pro Tyr Gly Glu Arg Thr
385 390 395 400

Gly Phe Lys Val Ala Tyr Lys Cys Arg Glu Lys Gly Val Phe Leu Arg
405 410 415

Pro Leu Gly Asp Val Met Val Leu Met Met Pro Leu Val Ile Glu Glu
420 425 430

Asp Glu Met Asn Tyr Val Ile Asp Thr Leu Lys Trp Ala Ile Lys Glu
435 440 445

Leu Glu Lys Glu Val
450

<210> 28
<211> 343
<212> PRT
<213> Aquifex

<400> 28

Met Thr Tyr Leu Met Asn Asn Tyr Ala Arg Leu Pro Val Lys Phe Val
1 5 10 15

Arg Gly Lys Gly Val Tyr Leu Tyr Asp Glu Glu Gly Lys Glu Tyr Leu
20 25 30

Asp Phe Val Ser Gly Ile Gly Val Asn Ser Leu Gly His Ala Tyr Pro
35 40 45

Lys Leu Thr Glu Ala Leu Lys Glu Gln Val Glu Lys Leu Leu His Val
50 55 60

Ser Asn Leu Tyr Glu Asn Pro Trp Gln Glu Glu Leu Ala His Lys Leu
65 70 75 80

Val Lys His Phe Trp Thr Glu Gly Lys Val Phe Phe Ala Asn Ser Gly
85 90 95

Thr Glu Ser Val Glu Ala Ala Ile Lys Leu Ala Arg Lys Tyr Trp Arg
100 105 110

Asp Lys Gly Lys Asn Lys Trp Lys Phe Ile Ser Phe Glu Asn Ser Phe
115 120 125

His Gly Arg Thr Tyr Gly Ser Leu Ser Ala Thr Gly Gln Pro Lys Phe
130 135 140

His Lys Gly Phe Glu Pro Leu Val Pro Gly Phe Ser Tyr Ala Lys Leu
145 150 155 160

Asn Asp Ile Asp Ser Val Tyr Lys Leu Leu Asp Glu Glu Thr Ala Gly
165 170 175

Ile Ile Ile Glu Val Ile Gln Gly Glu Gly Gly Val Asn Glu Ala Ser
180 185 190

a' Cord

Glu Asp Phe Leu Ser Lys Leu Gln Glu Ile Cys Lys Glu Lys Asp Val
195 200 205

Leu Leu Ile Ile Asp Glu Val Gln Thr Gly Ile Gly Arg Thr Gly Glu
210 215 220

Phe Tyr Ala Tyr Gln His Phe Asn Leu Lys Pro Asp Val Ile Ala Leu
225 230 235 240

Ala Lys Gly Leu Gly Gly Gly Val Pro Ile Gly Ala Ile Leu Ala Arg
245 250 255

Glu Glu Val Ala Gln Ser Phe Thr Pro Gly Ser His Gly Ser Thr Phe
260 265 270

Gly Gly Asn Pro Leu Ala Cys Arg Ala Gly Thr Val Val Val Asp Glu
275 280 285

Val Glu Lys Leu Leu Pro His Val Arg Glu Val Gly Asn Tyr Phe Lys
290 295 300

Glu Lys Leu Lys Glu Leu Gly Lys Gly Lys Val Lys Gly Arg Gly Leu
305 310 315 320

Met Leu Gly Leu Glu Leu Glu Arg Glu Cys Lys Asp Tyr Val Leu Lys
325 330 335

Ala Leu Glu Arg Asp Phe Ser
340

<210> 29

<211> 398

<212> PRT

<213> Ammonifex degensii

<400> 29

Met Arg Lys Leu Ala Glu Arg Ala Gln Lys Leu Ser Pro Ser Pro Thr
1 5 10 15

Leu Ser Val Asp Thr Lys Ala Lys Glu Leu Leu Arg Gln Gly Glu Arg
20 25 30

Val Ile Asn Phe Gly Ala Gly Glu Pro Asp Phe Asp Thr Pro Glu His
35 40 45

Ile Lys Glu Ala Ala Lys Arg Ala Leu Asp Gln Gly Phe Thr Lys Tyr
50 55 60

Thr Pro Val Ala Gly Ile Leu Pro Leu Arg Glu Ala Ile Cys Glu Lys
65 70 75 80

Leu Tyr Arg Asp Asn Gln Leu Glu Tyr Ser Pro Asn Glu Ile Val Val
85 90 95

Ser Cys Gly Ala Lys His Ser Ile Phe Asn Ala Leu Gln Val Leu Leu
100 105 110

Asp Pro Gly Asp Glu Val Ile Ile Pro Val Pro Tyr Trp Thr Ser Tyr
115 120 125

a'
Cont.

Pro Glu Gln Val Lys Leu Ala Gly Gly Val Pro Val Phe Val Pro Thr
 130 135 140
 Ser Pro Glu Asn Asp Phe Lys Leu Arg Pro Glu Asp Leu Arg Ala Ala
 145 150 155 160
 Val Thr Pro Arg Thr Arg Leu Leu Ile Leu Asn Ser Pro Ala Asn Pro
 165 170 175
 Thr Gly Thr Val Tyr Arg Arg Glu Glu Leu Ile Gly Leu Ala Glu Val
 180 185 190
 Ala Leu Glu Ala Asp Leu Trp Ile Leu Ser Asp Glu Ile Tyr Glu Lys
 195 200 205
 Leu Ile Tyr Asp Gly Met Glu His Val Ser Ile Ala Ala Leu Asp Pro
 210 215 220
 Glu Val Lys Lys Arg Thr Ile Val Val Asn Gly Val Ser Lys Ala Tyr
 225 230 235 240
 Ala Met Thr Gly Trp Arg Ile Gly Tyr Ala Ala Ala Pro Arg Pro Ile
 245 250 255
 Ala Gln Ala Met Thr Asn Leu Gln Ser His Ser Thr Ser Asn Pro Thr
 260 265 270
 Ser Val Ala Gln Ala Ala Ala Leu Ala Ala Leu Lys Gly Pro Gln Glu
 275 280 285
 Pro Val Glu Asn Met Arg Arg Ala Phe Gln Lys Arg Arg Asp Phe Ile
 290 295 300
 Trp Gln Tyr Leu Asn Ser Leu Pro Gly Val Arg Cys Pro Lys Pro Leu
 305 310 315 320
 Gly Ala Phe Tyr Val Phe Pro Glu Val Glu Arg Ala Phe Gly Pro Pro
 325 330 335
 Ser Lys Arg Thr Gly Asn Thr Thr Ala Ser Asp Leu Ala Leu Phe Leu
 340 345 350
 Leu Glu Glu Ile Lys Val Ala Thr Val Ala Gly Ala Ala Phe Gly Asp
 355 360 365
 Asp Arg Tyr Leu Arg Phe Ser Tyr Ala Leu Arg Leu Glu Asp Ile Glu
 370 375 380
 Glu Gly Met Gln Arg Phe Lys Glu Leu Ile Glu Ala Ala Leu
 385 390 395

<210> 30
 <211> 592
 <212> PRT
 <213> Aquifex

<400> 30

Met Cys Gly Ile Val Gly Tyr Val Gly Arg Asp Leu Ala Leu Pro Ile
 1 5 10 15

1
 Cont.

Val Leu Gly Ala Leu Glu Arg Leu Glu Tyr Arg Gly Tyr Asp Ser Ala
 20 25 30
 Gly Val Ala Leu Ile Glu Asp Gly Lys Leu Ile Val Glu Lys Lys Lys
 35 40 45
 Gly Lys Ile Arg Glu Leu Val Lys Ala Leu Trp Gly Lys Asp Tyr Lys
 50 55 60
 Ala Lys Thr Gly Ile Gly His Thr Arg Trp Ala Thr His Gly Lys Pro
 65 70 75 80
 Thr Asp Glu Asn Ala His Pro His Thr Asp Glu Lys Gly Glu Phe Ala
 85 90 95
 Val Val His Asn Gly Ile Ile Glu Asn Tyr Leu Glu Leu Lys Glu Glu
 100 105 110
 Leu Lys Lys Glu Gly Val Lys Phe Arg Ser Glu Thr Asp Thr Glu Val
 115 120 125
 Ile Ala His Leu Ile Ala Lys Asn Tyr Arg Gly Asp Leu Leu Glu Ala
 130 135 140
 Val Leu Lys Thr Val Lys Lys Leu Lys Gly Ala Phe Ala Phe Ala Val
 145 150 155 160
 Ile Thr Val His Glu Pro Asn Arg Leu Ile Gly Val Lys Gln Gly Ser
 165 170 175
 Pro Leu Ile Val Gly Leu Gly Glu Gly Glu Asn Phe Leu Ala Ser Asp
 180 185 190
 Ile Pro Ala Ile Leu Pro Tyr Thr Lys Lys Ile Ile Val Leu Asp Asp
 195 200 205
 Gly Glu Ile Ala Asp Leu Thr Pro Asp Thr Val Asn Ile Tyr Asn Phe
 210 215 220
 Glu Gly Glu Pro Val Ser Lys Glu Val Met Ile Thr Pro Trp Asp Leu
 225 230 235 240
 Val Ser Ala Glu Lys Gly Gly Phe Lys His Phe Met Leu Lys Glu Ile
 245 250 255
 Tyr Glu Gln Pro Lys Ala Ile Asn Asp Thr Leu Lys Gly Phe Leu Ser
 260 265 270
 Thr Glu Asp Ala Ile Pro Phe Lys Leu Lys Asp Phe Arg Arg Val Leu
 275 280 285
 Ile Ile Ala Cys Gly Thr Ser Tyr His Ala Gly Phe Val Gly Lys Tyr
 290 295 300
 Trp Ile Glu Arg Phe Ala Gly Val Pro Thr Glu Val Ile Tyr Ala Ser
 305 310 315 320
 Glu Phe Arg Tyr Ala Asp Val Pro Val Ser Asp Lys Asp Ile Val Ile
 325 330 335

a
 Cont

Gly Ile Ser Gln Ser Gly Glu Thr Ala Asp Thr Lys Phe Ala Leu Gln
 340 345 350
 Ser Ala Lys Glu Lys Gly Ala Phe Thr Val Gly Leu Val Asn Val Val
 355 360 365
 Gly Ser Ala Ile Asp Arg Glu Ser Asp Phe Ser Leu His Thr His Ala
 370 375 380
 Gly Pro Glu Ile Gly Val Ala Ala Thr Lys Thr Phe Thr Ala Gln Phe
 385 390 395 400
 Thr Ala Leu Tyr Ala Leu Ser Val Arg Glu Ser Glu Glu Arg Glu Asn
 405 410 415
 Leu Ile Arg Leu Leu Glu Lys Val Pro Ser Leu Val Glu Gln Thr Leu
 420 425 430
 Asn Thr Ala Glu Glu Val Glu Lys Val Ala Glu Lys Tyr Met Lys Lys
 435 440 445
 Lys Asn Met Leu Tyr Leu Gly Arg Tyr Leu Asn Tyr Pro Ile Ala Leu
 450 455 460
 Glu Gly Ala Leu Lys Leu Lys Glu Ile Ser Tyr Ile His Ala Glu Gly
 465 470 475 480
 Tyr Pro Ala Gly Glu Met Lys His Gly Pro Ile Ala Leu Ile Asp Glu
 485 490 495
 Asn Met Pro Val Val Val Ile Ala Pro Lys Asp Arg Val Tyr Glu Lys
 500 505 510
 Ile Leu Ser Asn Val Glu Glu Val Leu Ala Arg Lys Gly Arg Val Ile
 515 520 525
 Ser Val Gly Phe Lys Gly Asp Glu Thr Leu Lys Ser Lys Ser Glu Ser
 530 535 540
 Val Met Glu Ile Pro Lys Ala Glu Glu Pro Ile Thr Pro Phe Leu Thr
 545 550 555 560
 Val Ile Pro Leu Gln Leu Phe Ala Tyr Phe Ile Ala Ser Lys Leu Gly
 565 570 575
 Leu Asp Val Asp Gln Pro Arg Asn Leu Ala Lys Thr Val Thr Val Glu
 580 585 590
 <210> 31
 <211> 354
 <212> PRT
 <213> Aquifex
 <400> 31
 Met Ile Pro Gln Arg Ile Lys Glu Leu Glu Ala Tyr Lys Thr Glu Val
 1 5 10 15
 Thr Pro Ala Ser Val Arg Leu Ser Ser Asn Glu Phe Pro Tyr Asp Phe
 20 25 30

a!
 Cont.

Pro Glu Glu Ile Lys Gln Arg Ala Leu Glu Glu Leu Lys Lys Val Pro
 35 40 45
 Leu Asn Lys Tyr Pro Asp Pro Glu Ala Lys Glu Leu Lys Ala Val Leu
 50 55 60
 Ala Asp Phe Phe Gly Val Lys Glu Glu Asn Leu Val Leu Gly Asn Gly
 65 70 75 80
 Ser Asp Glu Leu Ile Tyr Tyr Leu Ser Ile Ala Ile Gly Glu Leu Tyr
 85 90 95
 Ile Pro Val Tyr Ile Pro Val Pro Thr Phe Pro Met Tyr Glu Ile Ser
 100 105 110
 Ala Lys Val Leu Gly Arg Pro Leu Val Lys Val Gln Leu Asp Glu Asn
 115 120 125
 Phe Asp Ile Asp Leu Glu Arg Ser Ile Glu Leu Ile Glu Lys Glu Lys
 130 135 140
 Pro Val Leu Gly Tyr Phe Ala Tyr Pro Asn Asn Pro Thr Gly Asn Leu
 145 150 155 160
 Phe Ser Arg Gly Lys Ile Glu Glu Ile Arg Asn Arg Gly Val Phe Cys
 165 170 175
 Val Ile Asp Glu Ala Tyr Tyr His Tyr Ser Gly Glu Thr Phe Leu Glu
 180 185 190
 Asp Ala Leu Lys Arg Glu Asp Thr Val Val Leu Arg Thr Leu Ser Lys
 195 200 205
 Ile Gly Met Ala Ser Leu Arg Val Gly Ile Leu Ile Gly Lys Gly Glu
 210 215 220
 Ile Val Ser Glu Ile Asn Lys Val Arg Leu Pro Phe Asn Val Thr Tyr
 225 230 235 240
 Pro Ser Gln Val Met Ala Lys Val Leu Leu Thr Glu Gly Arg Glu Phe
 245 250 255
 Leu Met Glu Lys Ile Gln Glu Val Val Thr Glu Arg Glu Arg Met Tyr
 260 265 270
 Asp Glu Met Lys Lys Ile Glu Gly Val Glu Val Phe Pro Ser Lys Ala
 275 280 285
 Asn Phe Leu Leu Phe Arg Thr Pro Tyr Pro Ala His Glu Val Tyr Gln
 290 295 300
 Glu Leu Leu Lys Arg Asp Val Leu Val Arg Asn Val Ser Tyr Met Glu
 305 310 315 320
 Gly Leu Gln Lys Cys Leu Arg Val Ser Val Gly Lys Pro Glu Glu Asn
 325 330 335
 Asn Lys Phe Leu Glu Ala Leu Glu Glu Ser Ile Lys Ser Leu Ser Ser
 340 345 350
 Ser Leu

a1
 Cont.

<210> 32
 <211> 303
 <212> PRT
 <213> Pyrobaculum aerophilum

<400> 32

Met Lys Pro Tyr Ala Lys Tyr Ile Trp Leu Asp Gly Arg Ile Leu Lys
 1 5 10 15

Trp Glu Asp Ala Lys Ile His Val Leu Thr His Ala Leu His Tyr Gly
 20 25 30

Thr Ser Ile Phe Glu Gly Ile Arg Gly Tyr Trp Asn Gly Asp Asn Leu
 35 40 45

Leu Val Phe Arg Leu Glu Glu His Ile Asp Arg Met Tyr Arg Ser Ala
 50 55 60

Lys Ile Leu Gly Ile Asn Ile Pro Tyr Thr Arg Glu Glu Val Arg Gln
 65 70 75 80

Ala Val Leu Glu Thr Ile Lys Ala Asn Asn Phe Arg Glu Asp Val Tyr
 85 90 95

Ile Arg Pro Val Ala Phe Val Ala Ser Gln Thr Val Thr Leu Asp Ile
 100 105 110

Arg Asn Leu Glu Val Ser Leu Ala Val Ile Val Phe Pro Phe Gly Lys
 115 120 125

Tyr Leu Ser Pro Asn Gly Ile Lys Ala Thr Ile Val Ser Trp Arg Arg
 130 135 140

Val His Asn Thr Met Leu Pro Val Met Ala Lys Ile Gly Gly Ile Tyr
 145 150 155 160

Val Asn Ser Val Leu Ala Leu Val Glu Ala Arg Ser Arg Gly Phe Asp
 165 170 175

Glu Ala Leu Leu Met Asp Val Asn Gly Tyr Val Val Glu Gly Ser Gly
 180 185 190

Glu Asn Ile Phe Ile Val Arg Gly Gly Arg Leu Phe Thr Pro Pro Val
 195 200 205

His Glu Ser Ile Leu Glu Gly Ile Thr Arg Asp Thr Val Ile Lys Leu
 210 215 220

Ser Gly Asp Val Gly Leu Arg Val Glu Glu Lys Pro Ile Thr Arg Glu
 225 230 235 240

Glu Val Tyr Thr Ala Asp Glu Val Phe Leu Val Gly Thr Ala Ala Glu
 245 250 255

Ile Thr Pro Val Val Glu Val Asp Gly Arg Thr Ile Gly Thr Gly Lys
 260 265 270

Pro Gly Pro Ile Thr Thr Lys Ile Ala Glu Leu Tyr Ser Asn Val Val

a'
Cont

275 280 285
 Arg Gly Lys Val Glu Lys Tyr Leu Asn Trp Ile Thr Pro Val Tyr
 290 295 300

<210> 33
 <211> 52
 <212> DNA
 <213> Artificial sequence

<220>
 <223> Primer for PCR

<400> 33
 ccgagaattc attaaagagg agaaattaac tatggcagtc aaagtgcggc ct 52

<210> 34
 <211> 31
 <212> DNA
 <213> Artificial sequence

<220>
 <223> Primer for PCR

<400> 34
 gaaggacctt cgaaacctat tcctaggagg c 31

<210> 35
 <211> 1092
 <212> DNA
 <213> Ammonifex degensii

<220>
 <221> misc_feature

<222> (986)..(987)
 <223> n is any nucleotide

a' Cont
 <400> 35
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 atcgaagagg taaagaagga gctggggctg gaggaggtag tcaagctggc ctccaacgag 120
 aaccctctgg gaccttctcc caaggccgtg gcggcgctgg agggactgga cactggcac 180
 ctttaccag aaggctcaag ctatgagcta cggcaggcgc tgggtaagaa actggagata 240
 gaccgggaca gcatcatcgt gggttgcggc tcaagcgaag tcatccagat gctctctttg 300
 gccctgctgg cgcccggcga cgaggtggtc atccctgtgc ctacctttcc ccgctatgag 360
 cccctggcac ggctcatggg ggctaattcc gtaaaagttc ccttgaagga ctaccgcac 420
 gatgtggagg cagtggccc agccctttcc ccccgtagca agctgggtcta cctatgcaac 480
 cccaacaacc ccaccgggac catcgtcacc cgggaggagg tggagtgggt cttggaaaag 540
 gcgggggagg gggttctcac cgtgctggac gaggcctact gcgagtacgt gaccagcccc 600

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gcctaccctg atgggctcga tttcctgcgc cggggctaca atgtggtggt gctgcgcacc 660
ttctccaaga tctacgggct ggccgggctg cgcatagggt acggtgtggc ggacagggag 720
ctggtggcgg aactgcaccg ggtgcgggag cctttcaatg tcagttccgc tgctcagata 780
gccgccctgg ccgccctgga agacgaagag ttcgtggcgc tttcgcgcca ggtcaacgaa 840
gaaggggaagg tttttctcta ccgagaactg gagaggcggg ggatcgcta cgtgcccacc 900
gaggccaact tcctactctt cgatgccggt cgggacgagc aggaagtatt tcgccggatg 960
ctgcgccagg gagtgatcat ccgggncggg gtgggttatc ccaccactt aagggtgacc 1020
atcggcacct tggaacagaa ccagcgcttc ctggaagctt tggataaggc tctagagctt 1080
aggggggttt aa 1092

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<210> 36
<211> 363
<212> PRT
<213> Ammonifex degensii

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<220>
<221> VARIANT

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<222> (329)..(330)
<223> Xaa is any Amino Acid

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<400> 36

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Met Ala Val Lys Val Arg Pro Glu Leu Ser Gln Val Glu Ile Tyr Arg
1          5          10          15
Pro Gly Lys Pro Ile Glu Glu Val Lys Lys Glu Leu Gly Leu Glu Glu
20        25        30
Val Val Lys Leu Ala Ser Asn Glu Asn Pro Leu Gly Pro Ser Pro Lys
35        40        45
Ala Val Ala Ala Leu Glu Gly Leu Asp His Trp His Leu Tyr Pro Glu
50        55        60
Gly Ser Ser Tyr Glu Leu Arg Gln Ala Leu Gly Lys Lys Leu Glu Ile
65        70        75        80
Asp Pro Asp Ser Ile Ile Val Gly Cys Gly Ser Ser Glu Val Ile Gln
85        90        95
Met Leu Ser Leu Ala Leu Leu Ala Pro Gly Asp Glu Val Val Ile Pro
100       105       110
Val Pro Thr Phe Pro Arg Tyr Glu Pro Leu Ala Arg Leu Met Gly Ala
115       120       125
Asn Pro Val Lys Val Pro Leu Lys Asp Tyr Arg Ile Asp Val Glu Ala
130       135       140
Val Ala Arg Ala Leu Ser Pro Arg Thr Lys Leu Val Tyr Leu Cys Asn
145       150       155       160

```

a' cont

Pro Asn Asn Pro Thr Gly Thr Ile Val Thr Arg Glu Glu Val Glu Trp
 165 170 175

Phe Leu Glu Lys Ala Gly Glu Gly Val Leu Thr Val Leu Asp Glu Ala
 180 185 190

Tyr Cys Glu Tyr Val Thr Ser Pro Ala Tyr Pro Asp Gly Leu Asp Phe
 195 200 205

Leu Arg Arg Gly Tyr Asn Val Val Val Leu Arg Thr Phe Ser Lys Ile
 210 215 220

Tyr Gly Leu Ala Gly Leu Arg Ile Gly Tyr Gly Val Ala Asp Arg Glu
 225 230 235 240

Leu Val Ala Glu Leu His Arg Val Arg Glu Pro Phe Asn Val Ser Ser
 245 250 255

Ala Ala Gln Ile Ala Ala Leu Ala Ala Leu Glu Asp Glu Glu Phe Val
 260 265 270

Ala Leu Ser Arg Gln Val Asn Glu Glu Gly Lys Val Phe Leu Tyr Arg
 275 280 285

Glu Leu Glu Arg Arg Gly Ile Ala Tyr Val Pro Thr Glu Ala Asn Phe
 290 295 300

Leu Leu Phe Asp Ala Gly Arg Asp Glu Gln Glu Val Phe Arg Arg Met
 305 310 315 320

Leu Arg Gln Gly Val Ile Ile Arg Xaa Gly Val Gly Tyr Pro Thr His
 325 330 335

Leu Arg Val Thr Ile Gly Thr Leu Glu Gln Asn Gln Arg Phe Leu Glu
 340 345 350

Ala Leu Asp Lys Ala Leu Glu Leu Arg Gly Val
 355 360

<210> 37
 <211> 52
 <212> DNA
 <213> Artificial sequence

<220>
 <223> Primer for PCR

<400> 37
 ccgagaattc attaaagagg agaaattaac tatgagaaaa ggacttgcaa gt

52

<210> 38
 <211> 31
 <212> DNA
 <213> Artificial sequence

<220>
 <223> Primer for PCR

<400> 38

a!
 Cont

tttcgggaac ttctctagat tcctaggagg c

31

<210> 39
 <211> 1185
 <212> DNA
 <213> Aquifex

<400> 39
 atgagaaaag gacttgcaag tagggtaagt cacctaaaac cttccccccac gctgaccata 60
 accgcaaaag caaaagaatt aagggtctaaa ggagtggacg ttatagggtt tggagcggga 120
 gaacctgact tcgacacacc cgacttcata aaggaagcct gtataagggc ttttaagggaa 180
 ggaaagacca agtacgctcc ctccgcggga ataccagagc tcagagaagc tatagctgaa 240
 aaactactga aagaaaacaa agttgagtac aaaccttcag agatagtcgt ttccgcagga 300
 gcgaaaatgg ttctcttctt catattcatg gctatactgg acgaaggaga cgagggttta 360
 ctacctagcc cttactgggt aacttacctt gaacagataa ggttcttcgg aggggttccc 420
 gttgaggttc ctctaaagaa agagaaagga tttcaattaa gtctggaaga tgtgaaagaa 480
 aagggttacgg agagaacaaa agctatagtc ataaactctc cgaacaaccc cactggtgct 540
 gtttacgaag aggaggaact taagaaaata gcggagtttt gcgtggagag gggcattttc 600
 ataatttccg atgagtgcta tgagtacttc gtttacggtg atgcaaaatt tgttagccct 660
 gcctctttct cggatgaagt aaagaacata accttcacgg taaacgcctt ttcgaagagc 720
 tattccatga ctggttggcg aatagggttat gtagcgtgcc ccgaagagta cgcaaaagtg 780
 atagcgagtc ttaacagcca gagtgtttcc aacgtcacta cttttgccc gtatggagct 840
 cttgaggcct tgaaaaatcc aaagtctaaa gattttgtaa acgaaatgag aaatgctttt 900
 gaaaggagaa gggatacggc tgtagaagag ctttctaaaa ttccaggtat ggatgtggta 960
 aaaccogaag gtgcctttta catatttccg gacttctccg cttacgctga gaaactgggt 1020
 ggtgatgtga aactctcgga gttccttctg gaaaaggcta aggttgcggt ggttcccggt 1080
 tcggccttcg gagctcccgg atttttgagg ctttcttacg ccctttccga ggaaagactc 1140
 gttgagggtta taaggagaat aaagaaagcc cttgaagaga tctaa 1185

<210> 40
 <211> 394
 <212> PRT
 <213> Aquifex

<400> 40

Met Arg Lys Gly Leu Ala Ser Arg Val Ser His Leu Lys Pro Ser Pro
 1 5 10 15

Thr Leu Thr Ile Thr Ala Lys Ala Lys Glu Leu Arg Ala Lys Gly Val

a
 Cont

20	25	30
Asp Val Ile Gly Phe Gly Ala Gly Glu Pro Asp Phe Asp Thr Pro Asp 35 40 45		
Phe Ile Lys Glu Ala Cys Ile Arg Ala Leu Arg Glu Gly Lys Thr Lys 50 55 60		
Tyr Ala Pro Ser Ala Gly Ile Pro Glu Leu Arg Glu Ala Ile Ala Glu 65 70 75 80		
Lys Leu Leu Lys Glu Asn Lys Val Glu Tyr Lys Pro Ser Glu Ile Val 85 90 95		
Val Ser Ala Gly Ala Lys Met Val Leu Phe Leu Ile Phe Met Ala Ile 100 105 110		
Leu Asp Glu Gly Asp Glu Val Leu Leu Pro Ser Pro Tyr Trp Val Thr 115 120 125		
Tyr Pro Glu Gln Ile Arg Phe Phe Gly Gly Val Pro Val Glu Val Pro 130 135 140		
Leu Lys Lys Glu Lys Gly Phe Gln Leu Ser Leu Glu Asp Val Lys Glu 145 150 155 160		
Lys Val Thr Glu Arg Thr Lys Ala Ile Val Ile Asn Ser Pro Asn Asn 165 170 175		
Pro Thr Gly Ala Val Tyr Glu Glu Glu Glu Leu Lys Lys Ile Ala Glu 180 185 190		
Phe Cys Val Glu Arg Gly Ile Phe Ile Ile Ser Asp Glu Cys Tyr Glu 195 200 205		
Tyr Phe Val Tyr Gly Asp Ala Lys Phe Val Ser Pro Ala Ser Phe Ser 210 215 220		
Asp Glu Val Lys Asn Ile Thr Phe Thr Val Asn Ala Phe Ser Lys Ser 225 230 235 240		
Tyr Ser Met Thr Gly Trp Arg Ile Gly Tyr Val Ala Cys Pro Glu Glu 245 250 255		
Tyr Ala Lys Val Ile Ala Ser Leu Asn Ser Gln Ser Val Ser Asn Val 260 265 270		
Thr Thr Phe Ala Gln Tyr Gly Ala Leu Glu Ala Leu Lys Asn Pro Lys 275 280 285		
Ser Lys Asp Phe Val Asn Glu Met Arg Asn Ala Phe Glu Arg Arg Arg 290 295 300		
Asp Thr Ala Val Glu Glu Leu Ser Lys Ile Pro Gly Met Asp Val Val 305 310 315 320		
Lys Pro Glu Gly Ala Phe Tyr Ile Phe Pro Asp Phe Ser Ala Tyr Ala 325 330 335		
Glu Lys Leu Gly Gly Asp Val Lys Leu Ser Glu Phe Leu Leu Glu Lys 340 345 350		

a'
cont

Ala Lys Val Ala Val Val Pro Gly Ser Ala Phe Gly Ala Pro Gly Phe
355 360 365

a¹ Leu Arg Leu Ser Tyr Ala Leu Ser Glu Glu Arg Leu Val Glu Gly Ile
370 375 380

Arg Arg Ile Lys Lys Ala Leu Glu Glu Ile
385 390
